



National Aeronautics and Space Administration
Goddard Earth Sciences
Data Information and Services Center (GES DISC)

README Document for

Nimbus-7

Solar Backscatter Ultraviolet (SBUV) data:

Total Ozone and Ozone Profiles

(Nov. 1978 – Jun. 1990)

Last Revised 04/06/2011

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1. Introduction

This document provides basic information for using the Nimbus-7 Solar Backscatter Ultraviolet (SBUV) data. The SBUV instrument was launched on the NASA Nimbus-7 satellite and made measurements from November 1978 through June 1990. The instrument measures backscattered ultraviolet radiation at 12 different wavelengths to determine total ozone and vertical ozone profiles [Bhartia et al., 1993, 1995, McPeters et al., 1984, 1994, Cebula et al., 1988, Heath et al., 1975, Fishman et al., 1996, Herman et al., 1991]. The SBUV instrument was originally developed to measure stratospheric ozone. Its repeat cycle allowed for global coverage every 6 days, or every 83 orbits. Nimbus-7 flew in a Sun-synchronous orbit with an equator-crossing time around 1200 UT, and made ascending node (day time) observations up to $\sim 81^\circ$ latitude. During summer months, descending node measurements were also made at high solar zenith angles (SZA ~ 72 – 88°), at latitudes back down to $\sim 68^\circ$.

Nimbus 7 Specification:
Platform: Category: Earth Observation Satellites (995 km Sun-synchronous orbit)
Platform series/Entity: Nimbus
Synonymous Platform Names: Nimbus-G
Launch Date: 1978-10-24
Launch site: Vandenberg Air Force Base, USA
Primary sponsors: USA/NASA
Orbit inclination: 99.1 degree
Equator Crossing Time: 12: PM for ascending and 12:00 AM for descending
Platform based instruments: SBUV, CZCS, TOMS, LIMS, THIR, SAMS, SMMR and ERB

1.1 Mission Instrument Description

The SBUV instrument is a nadir-viewing double-grating monochromator of the Ebert-Fastie type. The instrument steps through 12 wavelengths in sequence over 24 seconds, while viewing the Earth in the fixed nadir direction with an instantaneous field of view (IFOV at nadir ~ 0.20 rad) on the ground of ~ 180 km x 180 km. To account for the change in the scene-reflectivity due to the motion of the satellite during the course of a scan, a separate co-aligned filter photometer (centered at 343 nm) makes 12 measurements concurrent with the 12 monochromator measurements. Each sequence of measurements is separated by 8 seconds from the next, producing a complete set in every 32 seconds on the daylight portions of an orbit. The instruments is flown in polar orbit to obtain global coverage. SBUV measurements are made only along the orbital track from 80° S to 80° N, with orbits spaced approximately 26 degree apart in longitude. There are about 14 orbits per day with 26 degrees of separation at the equator.

The SBUV used three detectors: A photomultiplier tube (PMT), a photodiode for the monochromator and one photodiode for the photometer. The spectral resolution for SBUV is 1.1 nm and bandwidth is ~ 3 nm. Detailed instrument descriptions can be found in Heath et al [1975]. Since the SBUV ozone measurements rely on backscattered solar radiation, data are only taken on the day side of each orbit. In normal operation, SBUV measures sunlight backscattered from the Earth-atmosphere system at 12 discrete wavelengths, from 255.5 to 339.8 nm. The wavelength channels used for ozone retrievals for SBUV were: 256, 273, 283, 288, 292, 298, 302, 306, 312, 318, 331 and 340nm. In the spectral scan mode, it measures solar irradaiances and earth radaiances from 160 to 400 nm in 0.2 nm steps, with a 1.1 nm half-width triangular bandpass.

1.2 Algorithm Background

The algorithm and methodology employed for SBUV ozone profiles are based on version 8 (V8) algorithm. V8 is the updated version of a series of back scattered ultraviolet (BUV) total ozone algorithms that have been developed since the original algorithm proposed by Dave and Mateer [1967]. These algorithms have been progressively refined [Klenk et al., 1982; McPeters et al., 1996; Wellemeyer et al., 1997] with better understanding of UV radiation transfer, internal consistency checks, and comparison with ground-based instruments. The V8 version combines backscattered UV measurements and a priori information in a maximum likelihood retrieval.

SBUV compared incident solar radiation to radiation backscattered from the atmosphere to determine ozone levels. Ozone profiles and total column amounts are derived from the ratio of the observed backscattered spectral radiance to the incoming solar spectral irradiance. This ratio is referred to as the backscattered albedo. The only difference in the optical components between the radiance and irradiance observations is the instrument diffuser used to make the solar irradiance measurement; the remaining optical components are identical. Therefore, a change in the diffuser reflectivity will result in an apparent trend in ozone. This is the key calibration component [Hilsenrath et al., 1995]. 12 discrete wavelengths of UV radiations were collected by the sensor, and this information was used to estimate vertical ozone profiles and total ozone. UV radiation at different wavelengths penetrates into the atmosphere, thus providing information on ozone at different isobaric levels. The instrument was limiting to measure ozone profiles above the maximum and total ozone directly beneath the satellites.

Long-term SBUV instrument corrections have been discussed elsewhere [Cebula *et al.*, 1988]. Corrections to the data were applied by using a generalized Langley plot method [Bhartia *et al.*, 1995], to further calibrate ozone profile data through 1990. In early 1987, the instrument began to lose synchronization between its chopper wheel and its electronics, introducing apparent noise into the individual measurements. A reprocessed data was prepared based on a correction procedure developed for this non-sync error [Gleason et al., 1995]. These data do not appear to be biased but are generally noisier and should be considered inferior to the data preceding the onset of the non-sync errors. Descriptions of the algorithm and averaging kernel plots for SBUV are provided in the earlier published documents by NASA SBUV and NOAA V8 SBUV(2) team. These are available with the URL:

http://macuv.gsfc.nasa.gov/V8_Algorithm_Description.md

1.3 SBUV Data Quality

1.3.1 Profile Data Screening

The SBUV algorithm applies a number of quality control tests to each profile ozone measurement during processing. The results of these tests are summarized in the profile error flag listed in each compressed data record. An additional measure of data quality is provided by the final residual values for each profile. The final residual at each wavelength represents the difference between the predicted radiance (calculated using the solution for ozone profile) and the observed radiance. On this data set all final residual values for each profile are combined into a residual quality control parameter (ResQC) that can be used to select data for further analysis.

1.3.2 Data Selection Suggestions

The SBUV ozone profile data records contain flags that can be used to select specific types of data for analysis. This brief description here provides suggestions on how to use the profile error flags and residual quality control flags (ResQC) to create the best ozone data set. The profile error flag has three components: the digit in the units place indicates the profile error code, the digit in the tens place indicates an ascending [0] or descending [1] orbit measurement, and the digit in the hundreds place indicates the validation code.

1. Initial data analysis should only use data with a profile error flag of 0. This selects ascending orbit measurements with the profile error code and validation code equal to 0, and a maximum solar zenith angle of 84 degrees. These data have a maximum ResQC value of 0.20. For any individual instrument, we recommend choosing the lowest ResQC limit that still provides sufficient data coverage in order to maximize overall data set quality. A time history of monthly ResQC flag values for equatorial ozone measurements is shown in Figure 1. Additional coverage during summer months at high latitudes can be obtained by accepting descending orbit measurements (a profile error flag of 10) to ensure that all profiles up to solar zenith angles of 84 degrees are available.

2. ResQC values greater than 0.20 may indicate either an instrument measurement error for that scan and/or an atmospheric effect not accounted for by the V8 ozone algorithm. To analyze data with ResQC values greater than 0.2, the user should include measurements with a profile error code of 3 (*e.g.*, profile error flags equal to 3 and 13). An additional filter for specific ResQC limits can be added, based on user analysis requirements. Further information about high ResQC scans and a complete listing of final residue values for all wavelengths is available in the complete level 2 data record.

3. Restricting data selection to profile error flags less than 100 (validation codes of 0) will leave gaps in the overall time period represented by the V8 data. If a complete time series is desired, the user should also include data with validation codes of 1. This corresponds to selecting profile error flag equal to 100 for ascending orbit measurements.

4. Increased coverage at high latitudes can be obtained by including data with a profile error code of 1 (solar zenith angles from 84 to 88 degrees). This corresponds to profile error flags equal to 1 and 101 for ascending orbit data, and profile error flags equal to 11 and 111 for descending orbit data.

5. Data selection may be further expanded by including profile error codes of 2, 4, and 5. The user should be aware that these codes generally indicate significant anomalies in the profile retrieval, and analysis results including such data should be evaluated with caution.
6. ResQC values are significantly affected by stratospheric aerosols following major volcanic eruptions (*e.g.*, El Chichón in April 1982), and can also show increases due to atmospheric effects such as sea glint, clouds, and large amounts of aerosols. The magnitude of the impact on ResQC values will depend on observation conditions, and is sensitive to the solar zenith angle of the measurement.

1. 3. 3 V8 Profile Error Code

This section describes all profile error code values created by the algorithm. Please note that only profiles with error codes equal to 0 through 5 are included in the data set. If more than one value among error codes 2-9 can be applied to a profile, the highest value is used. A summary list is presented first, followed by a more detailed description of each code value.

- 0 – Good retrieval.
- 1 – Solar zenith angle > 84 degrees.
- 2 – $\text{abs}[\text{Step 3 total ozone} - \text{Profile total ozone}] > 25 \text{ D.U.}$
- 3 – Average $\text{abs}[\text{final residue}] > 0.20 \text{ N-value.}$
- 4 – $\text{abs}[\text{Final residue}] > (3 * \text{instrument error}).$
- 5 – $\text{abs}[\text{Retrieved} - A \text{ Priori}] > (3 * a \text{ priori error}).$
- 6 – Non-convergent solution.
- 7 – Upper level profile anomaly – only solar eclipse related for this DVD.
- 8 – Initial residue greater than 18.0 N-value units.
- 9 – Total ozone algorithm failure: first guess not available.
- 10 is added to the error flag value to indicate data taken in descending mode.
- 100 is added to the error flag value to indicate a broad period of lesser quality data (see details given below)

Definitions

- 0. No problems or anomalies in the profile retrieval.
- 1. The profile retrieval may have increased uncertainty at high SZA. Note that if this flag is set, *i.e.*, the SZA is greater than 84 degrees, then the tests for error codes 2 through 5 are not applied.
- 2. The algorithm calculates total ozone values using two methods: both by performing a TOMS Version 8-type retrieval (Step 3), and by summing all layers in the ozone profile (Profile). If the difference between these results exceeds 25 Dobson units, the profile error code is set to 2.

3. The final residue is calculated for each wavelength used in the profile retrieval and expressed in terms of N-value, where $N_\lambda = -100\log_{10}(I_\lambda/F_\lambda)$. We use the absolute value of each final residue and calculate the average to create the residual quality control flag (ResQC) for each profile. If ResQC is greater than 0.20, the error code is set to 3.
4. If the final residue at any wavelength is greater than 3 times the specified instrument error (currently 1.0%), the error code is set to 4.
5. If the difference between the retrieved ozone profile and the *a priori* ozone profile in any layer is greater than 3 times the specified *a priori* error (currently 50%), the error code is set to 5.
6. If the profile algorithm fails to converge on a solution after eight iterations, the error code is set to 6.
7. If the solution profile above 1 hPa deviates significantly from an exponential altitude dependence, the error code is set to 7.
8. For profiles with very large residue values, the error code is set to 8.
9. If the total ozone algorithm retrieval is unsuccessful, no profile retrieval is attempted, and the error code is set to 9.

1.3.4 Validation Code

The validation code is set to 1 (*i.e.*, a value of 100 is added to the V8 profile error flag) to indicate periods where we have less confidence in the profile ozone data, based on internal validation results. This code frequently represents instrument performance problems. In most cases, the best available correction for the problem has been applied to the data, but residual errors may still be present. The quality of total ozone and the quality of profile ozone data are both affected. Small jumps of 1-2% in total ozone and 5-10% in profile ozone may be observed. Due to the increased noise during such periods, we are unable to identify every perturbed profile with an error flag. Please view unusual profiles during these periods with some skepticism. The validation code is also used to indicate periods where ozone data show greater differences in limited latitude and/or altitude regions.

1.4 Data Disclaimer

Data should be used with care and proper citations. The following data related issues should be taken into account while using the data for user applications. The data is mainly intended for stratospheric studies. Also to note that the vertical resolution of ozone and quality of the data over the troposphere is limited.

1.4.1 Short-Term Effects on ResQC Values

Examination of ResQC values in a restricted latitude band can provide a good indication of the onset and duration of volcanic effects in the V8 data. For example, Nimbus-7 SBUV ResQC values between 17-23°N are affected for approximately six months after the eruption of El Chichón in April 1982. The magnitude and duration of volcanic effects also depends on solar

zenith angle. Elevated ResQC values can also be caused by the presence of sea glint, which is observed in Nimbus-7 SBUV data at low latitudes in summer months.

1.4.2 Nimbus-7 SBUV Non-Sync [February 1987 to June 1990]

The Nimbus-7 SBUV chopper wheel began to lose synchronization with the counting electronics on February 13, 1987. This problem renders results unsuitable for long term Ozone trend determination. Measurements made after this date were characterized by significantly higher noise in each scan. A correction function was developed based on the coherence of coincident 343 nm photometer data, as described by Gleason and McPeters [1995]. This correction decreased monthly average Umkehr layer ozone standard deviation values by 20 to 50%. Nimbus-7 profile ozone data during the "non-sync" period (1987 to 1990) do not show a bias relative to the 1978 to 1986 data. However, anomalous profiles are much more likely to occur during this period, and users should be cautious when examining individual ozone profiles. Approximately 15% of the Nimbus-7 profiles during the non-sync period have ResQC values greater than 0.2.

1.4.3 Nimbus-7 SBUV Hysteresis

The Nimbus-7 SBUV instrument had a problem with the response of its photomultiplier tube (PMT) when emerging from darkness, such that observed Southern Hemisphere radiance values could be up to 8% lower than expected at SZAs of 88 degrees. The magnitude of the error rapidly decreased as the satellite moved northward, and reached zero by SZAs of 50 degrees. A SZA-dependent and time-dependent correction function was developed based on comparisons with concurrent reference photodiode measurements, and has been implemented in V8 ozone processing. Validation results suggest that residual errors of up to 3-4% may still be present at high SH latitudes in the later portion of the Nimbus-7 record. Northern Hemisphere measurements are not affected by this problem.

1.4.4 SBUV Data Gaps

The SBUV instruments are designed to provide continuous measurements of the sunlit hemisphere of the Earth. However, instrument and spacecraft problems sometimes interfere with this objective. The following list identifies intervals (Year/Day of Year – Year/Day of Year) where data coverage is limited or unavailable with this data set. This is mainly because no Northern Hemisphere descending node data due to special solar measurements.

Missing Data Intervals
<i>Year/Day - Year/Day</i>
1980/198 – 1980/324
1981/183 – 1981/261
1984/139 – 1984/204
1986/177 – 1986/219

2.0 Data Organization

The data directory contains a complete time series of records of atmospheric ozone profiles from 30th October 1978 to 26th June 1990 derived from the SBUV instrument. As discussed in the above sections and indicated by the Error Codes and the Residue Quality Control (Residue QC) parameters in the data files, the overall data quality varies with instrument and time. In the data directory, there are subdirectories for each year containing the daily data files stored in ASCII format. A sample ASCII file shows the beginning of a daily file with eight lines of header and the subsequent first three 3-line data records. As briefly described in the header, each data record starts with 11 parameters relative to the profile, followed by ozone amounts in Dobson Units for 13 layers (Table 1) and finally the ozone concentrations in PPMV units at 15 pressure levels (Table 2). A brief description of the first eleven parameters is as follows:

<i>Parameter</i>	<i>Description</i>
Year	The four digit common era year
Day_of_Year	The day of the year with January 1st equal to 1
GMT_seconds	The Greenwich Mean Time at the start of the measurement
Latitude	The Latitude (Degrees North) of the measurement
Longitude	The Longitude (Degrees East) of the measurement
Solar_Zenith	The Solar Zenith Angle (Degrees) of the measurement
Total_Ozone	The total column ozone in Dobson Units from the ground up
Reflectivity	Effective reflectivity from the ground and/or clouds.
Aerosol_Index	Significant quantities indicate the presence of aerosols.
Quality_Residue	Average of the absolute final residues.
Error_Flag	Three digit error code

Note: a daily file may contain part of an orbit of data from the following day, and some of the data for the start of a day may only appear in the preceding day's file. All data products provide global earth coverage from 80N to 80S with a horizontal resolution of 200 X 200 km. Data are available from 30th October 1978 to 21st June 1990. However it is reported that the data after 13th February 1987 is not suitable for trend studies due to SBUV instrument problems. These files can be accessed by modifying one of the sample IDL or FORTRAN 90 programs to read in a day's data.

2.1 File Format, Structure and Naming Convention

The data have been stored in the ASCII format and they contain spatial-temporal information and data quality flags.

The file naming convention for the data files are of the form *sbus_n07_yyyymmdd.txt* for the year 1978 to 1990 (*Y1978:Y1990*)

Where ***sbuv_n07*** represent the Nimbus 7 SBUV data,
yyyy: data year,
mm: data month,
dd: data date

File name example: ***sbuv_n07_19781031.txt***,,
sbuv_n07_19900621.txt

The data header of each file contains the information and what it represents.

2.2 Key Science Data Fields

The key parameters are ozone profile data (in Dobson unit [DU], expressed in terms of abundance], 13 layers as shown below, however in the data set the base pressure levels in 'physical atmosphere (atm)' are shown for each layer, for an example: ***1013-63.93 hPa ~1.000 atm***) and ozone concentration (***ppmv***) at 15 isobaric levels from 50 hPa to 0.5 hPa. In addition to this, daily total ozone (in ***DU***) is also provided. The other parameters along with them are solar zenith angle, reflectivity and aerosol index.

2.2.1 Ozone Profiles (in DU):

The data set contains Nimbus 7 SBUV v8 ozone profile Data. The layers are defined as shown in the table given below..

<i>Layer</i>	<i>Base Pressure (atm)</i>	<i>Pressure Levels</i>
1	1.000	1013. - 63.93 hPa
2	0.0631	63.93 – 40.33 hPa
3	0.0400	40.33 - 25.45 hPa
4	0.0251	25.45 - 16.06 hPa
5	0.0158	16.06 - 10.13 hPa
6	0.0100	10.13 - 6.393 hPa
7	0.0063	6.393 - 4.034 hPa
8	0.0040	4.034 - 2.545 hPa
9	0.00251	2.545 - 1.606 hPa
10	0.00158	1.606 - 1.013 hPa
11	0.0010	1.013 - 0.639 hPa
12	0.00063	0.639 - 0.403 hPa
13	0.00040	0.403 - 0.000 hPa

2.2.2 Ozone Mixing Ratio (ppmv)

Data contains Nimbus 7 SBUV v8 ozone mixing ratio (ppmv) for the following 15 isobaric levels: 50.0 hPa , 40.0 hPa, 30.0 hPa, 20.0 hPa, 15.0 hPa, 10.0 hPa, 7.0 hPa, 5.0 hPa, 4.0 hPa, 3.0 hPa, 2.0 hPa, 1.5 hPa, 1.0 hPa, 0.7 hPa, 0.5 hPa.

2.3 Science Area

The Nimbus 7 satellite served as a stabilized, earth-oriented platform for the testing of advanced systems for sensing and collecting data in the pollution, oceanographic and meteorological disciplines [NASA report, 1978]. Operational from 1978-1993, Nimbus 7 had the longest duration of any satellite mission to observe the changing atmospheric composition especially ozone over the earth. SBUV is one of the three instruments on the satellite measured ozone. The remaining of them are the Limb Infrared Monitor of the Stratosphere (LIMS) and the Total Ozone Mapping Spectrometer (TOMS). Data from the SBUV instrument is selected to give a complete time series using the highest quality data available during this period. There are notable studies based on this data set including the declining trend of total global average ozone over the 11 year period (IPCC 1995, Jackman et al., 1989, Joiner et al., 1991, Stolarski et al., 1986).

The purpose of the SBUV instrument is to measure the Solar irradiance and Earth radiance in the near ultraviolet spectrum. From these data, the following atmospheric properties can be deduced: (i) the global and vertical distribution of stratospheric ozone, (ii) the structure and dynamics of stratospheric ozone, (iii) photochemical processes and the influence of trace constituents on the ozone layer and (iv) the long-term solar activity in the UV spectrum.

3.0 Data Contents

3.1 Dimensions

This data sets provide global earth coverage from 80°N to 80°S with a horizontal resolution of 200 km by 200 km. From an 800 km orbit, Nimbus7 instantaneous field of view (IFOV) results in an Earth scene size of ~ 200 km square. As the instrument IFOV moves along the satellite track, at roughly 6 km/sec, the Earth scene moves about 200 km during each 32 second spectral scan. Vertical resolution is determined by the radiative and scattering properties of the atmosphere for a nadir viewing instrument and is roughly 8 km in the upper stratosphere [Bhartia *et al.*, 1996].

4.0 Options for Reading the Data

4.1 Tools/Programming

In the SBUVN7O3.008 directory, there are subdirectories for each year containing the daily data files in ASCII format. A sample ASCII file with 3 records for 1978/10/31 is shown below. The

beginning of a daily file with eight lines of header and the subsequent first three 3-line data records. As briefly described in the header, each data record starts with 11 parameters relative to the profile, followed by ozone amounts in DU for 13 layers and finally the ozone concentrations in PPMV units at 15 pressure levels. A brief description of the first eleven parameters is given above in section 2.

Example:

Version 8.0 n07 SBUV data for day 304 1978 (1978/10/31)

316 :Number of records

1) year day sec-gmt Lat Lon SZA Total_Ozone Reflectivity Aerosol_Index Quality_residue Error_Flag

2) ozone (DU) in 13 layers -- pressure level at the bottom of each layer(atm):

1.000 0.0631 0.0400 0.0251 0.0158 0.0100 0.0063 0.0040 0.00251 0.00158 0.0010 0.00063 0.00040

3) ozone (PPMV) at 15 pressure levels(hPa):

0.5 0.7 1.0 1.5 2.0 3.0 4.0 5.0 7.0 10.0 15.0 20.0 30.0 40.0 50.0

```
1978 304 58922 -24.32 -63.93 11.77 282.1 0.749 100.0 0.048 0
55.36 32.03 48.99 47.856 40.590 27.963 15.508 7.676 3.474 1.491 0.6516 0.2848 0.2188
1.459 1.915 2.533 3.528 4.508 6.129 7.277 8.138 9.216 9.417 7.999 6.527 4.590 3.029 1.800
1978 304 58954 -22.51 -64.41 10.11 278.8 0.680 100.0 0.030 0
52.27 31.18 48.26 47.827 40.964 28.335 15.832 7.851 3.538 1.522 0.6678 0.2926 0.2248
1.499 1.965 2.592 3.595 4.589 6.263 7.454 8.316 9.355 9.527 8.056 6.527 4.531 2.963 1.752
1978 304 58986 -20.68 -64.90 8.50 260.2 0.466 100.0 0.081 0
40.32 26.70 43.29 46.668 42.934 29.854 16.072 7.993 3.663 1.551 0.6632 0.2866 0.2216
1.467 1.936 2.599 3.695 4.758 6.410 7.517 8.403 9.735 10.142 8.304 6.388 4.097 2.574 1.497
```

313 additional records were deleted from the file for this example.

Note: The number of records in a day file can be accessed from the the URL:

ftp://acdisc.gsfc.nasa.gov/data/s4pa/Nimbus7_SBUV_Level2/SBUVN7O3.008/doc/n07_sum_CRLF.txt

Note: a daily file may contain part of an orbit of data from the following day, and some of the data for the start of a day may only appear in the preceding day's file.

These files can be accessed by modifying one of the sample IDL (*read_compv8sbuf_sg_pro*) or FORTRAN 90 (*read_compv8_sg_F90*) programs in the **software** folder/directory to read in a day's data from the URL:

ftp://acdisc.gsfc.nasa.gov/data/s4pa/Nimbus7_SBUV_Level2/SBUVN7O3.008/software

5.0 Data Services

GES-DISC provides basic temporal and advanced (event) searches through its search and download engine, MIRADOR:

<http://mirador.gsfc.nasa.gov>

Mirador offers various download options that suit users with different preferences and different levels of technical skills. Users can start from a point where they don't know anything about these particular data, its location, size, format, etc., and quickly find what they need by just providing relevant keywords, like 'SBUV', 'total Ozone', 'Ozone Profile' or 'Nimbus 7'.

6.0 More Information

For access to the NOAA SBUV/2 version 8 data files please go to the NOAA/NESDIS web site at <http://www.star.nesdis.noaa.gov/smcd/spb/ozone/>

For other ozone and related data, please search NASA's Global Change Master Directory at <http://gcmd.nasa.gov>

7.0 Acknowledgments

The Nimbus-7 SBUV version 8 data were created by the Ozone Processing Team at NASA/GSFC and NOAA/NESDIS. The SBUV data files archived at the GES DISC are identical to those provided on the SBUV(/2) DVD created in 2004.

List of PIs:

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Richard McPeters

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NOAA/NESDIS

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